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**Coating material and its use for producing highly
scratch-resistant multicoat clearcoat systems**

Claims

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1. A coating material curable thermally and, if
desired, with actinic radiation, comprising

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A) at least one binder containing at least two
functional groups (a1) which are able to
undergo thermal crosslinking reactions with
complementary functional groups (b1) in the
crosslinking agent (B), and

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B) at least one crosslinking agent containing at
least two functional groups (b1) which are
able to undergo thermal crosslinking
reactions with the complementary functional
groups (a1) in the binder (A),

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and also, if desired,

25

C) at least one constituent which is
crosslinkable with actinic radiation,

D) at least one photoinitiator,

E) at least one thermal crosslinking initiator,

F) at least one reactive diluent curable with actinic radiation and/or thermally,

5 G) at least one coatings additive, and/or

H) at least one organic solvent,

10 characterized in that at least one binder (A) contains in copolymerized form at least one olefinically unsaturated polysiloxane macromonomer containing on average per molecule at least 3.0 double bonds.

15 2. The coating material as claimed in claim 1, characterized in that the polysiloxane macromonomer contains on average per molecule at least 4.0, with particular preference at least 5.0, and in particular at least 5.5 double bonds.

20 3. The coating material as claimed in claim 1 or 2, characterized in that the polysiloxane macromonomer contains on average per molecule up to 10.5, preferably 9.0, with particular preference 8.5, and in particular 8.0 double bonds.

25 4. The coating material as claimed in any of claims 1 to 3, characterized in that the polysiloxane

macromonomer contains on average per molecule from 5.5 to 6.5, in particular 6.0, double bonds.

5. The coating material as claimed in any of claims 1 to 4, characterized in that the polysiloxane macromonomer has a number-average molecular weight M_n of from 500 to 100 000, preferably from 1 000 to 50 000, with particular preference from 2 000 to 30 000, and in particular from 2 500 to 20 000 daltons.
6. The coating material as claimed in any of claims 1 to 4, characterized in that the polysiloxane macromonomer is in three-dimensionally crosslinked form.
7. The coating material as claimed in any of claims 1 to 5, characterized in that the polysiloxane macromonomer is an alkyl-, cycloalkyl-, alkyl-aryl-, alkyl-cycloalkyl-, cycloalkyl-aryl- or arylsiloxane resin.
8. The coating material as claimed in claim 6, characterized in that the alkyl radicals contain from 1 to 10, with particular preference from 1 to 5, and in particular from 1 to 3 carbon atoms, the cycloalkyl radicals contain from 3 to 10, with particular preference from 4 to 8, and in particular from 5 to 7 carbon atoms, and the aryl

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radicals contain from 6 to 12 and, in particular, from 6 to 10 carbon atoms.

9. The coating material as claimed in claim 6 or 7,
5 characterized in that it comprises an
alkylsiloxane resin, in particular a methyl-
siloxane resin.
10. The coating material as claimed in any of claims 1
10 to 8, characterized in that the polysiloxane
macromonomer contains, as groups having
olefinically unsaturated double bonds, acrylic,
methacrylic, ~~ethacrylic~~ vinyl, allyl and/or
crotonyl groups, with particular preference
15 acrylic, methacrylic and vinyl groups, and
especially acrylic groups.
11. The coating material as claimed in any of claims 1
20 to 9, characterized in that at least one of the
binders (A) contains in copolymerized form up to
15% by weight, preferably up to 10% by weight,
with particular preference up to 5% by weight, and
in particular up to 2% by weight, based in each
case on the binder (A), of at least one
25 polysiloxane macromonomer according to any of
claims 1 to 9.
12. The coating material as claimed in any of claims 1
to 10, characterized in that at least one of the

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binders (A) contains in copolymerized form at least 0.01% by weight, preferably at least 0.05% by weight, with particular preference at least 0.08% by weight, and in particular at least 0.1% by weight, based in each case on the binder (A), of at least one polysiloxane macromonomer according to any of claims 1 to 9.

13. A multicoat clearcoat system KL for a primed or unprimed substrate, producible by

(1) applying at least one clearcoat film I of a coating material I curable thermally and, if desired, with actinic radiation to the surface of the substrate and

(1.1) partly or

(1.2) fully

curing it, and

(2) applying a further clearcoat film II of a coating material II curable thermally and, if desired, with actinic radiation to the surface of the clearcoat film(s) I

(3) and then curing

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(3.1) the clearcoat films I and II together
or

(3.2) the clearcoat film II alone,

5 thermally and, if desired, with actinic
radiation

characterized in that the coating material II
and/or the coating material I, especially the
10 coating material II, is a coating material as
claimed in any of claims 1 to 11.

14. A process for producing a multicoat clearcoat
system KL on a primed or unprimed substrate by

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(1) applying at least one clearcoat film I of a
coating material I curable thermally and, if
desired, with actinic radiation to the
surface of the substrate and

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(1.1) partly or

(1.2) fully

curing it, and

25

(2) applying a further clearcoat film II of a
coating material II curable thermally and, if
desired, with actinic radiation to the
surface of the clearcoat film(s) I

(3) and then curing

(3.1) the clearcoat films I and II together
or

(3.2) the clearcoat film II alone,

thermally and, if desired, with actinic
radiation

characterized in that the coating material II
and/or the coating material I, especially the
coating material II, is a coating material as
claimed in any of claims 1 to 11.

15. A multicoat color and/or effect paint system ML
for a primed or unprimed substrate, producible by

(1) applying at least one color and/or effect
basecoat film III of a pigmented coating
material III curable thermally and, if
desired, with actinic radiation to the
surface of the substrate, and drying it
without curing,

(2) applying at least one clearcoat film I of a
coating material I curable thermally and, if
desired, with actinic radiation to the
surface of the basecoat film III, and

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(2.1) partly curing it alone,
(2.2) partly curing it together with the
basecoat film III, or
5 (2.3) fully curing it together with the
basecoat film III,

thermally and, if desired, with actinic
radiation, and

10 (3) applying a further clearcoat film II of a
coating material II durable thermally and, if
desired, with actinic radiation to the
surface of the clearcoat film(s) I,

15 (4) and then curing

(4.1) the clearcoat films I and II and the
basecoat film III together or

20 (4.2) the clearcoat film II alone,

thermally and, if desired, with actinic
radiation,

25 characterized in that the coating material II
and/or the coating material I, especially the
coating material II, is a coating material as
claimed in any of claims 1 to 11.

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16. A process for producing a multicoat color and/or effect paint system ML on a primed or unprimed substrate by

5 (1) applying at least one color and/or effect basecoat film III of a pigmented coating material III curable thermally and, if desired, with actinic radiation to the surface of the substrate, and drying it
10 without curing,

(2) applying at least one clearcoat film I of a coating material I curable thermally and, if desired, with actinic radiation to the
15 surface of the basecoat film III, and

(2.1) partly curing it alone,
(2.2) partly curing it together with the basecoat film III, or

20 (2.3) fully curing it together with the basecoat film III,

thermally and, if desired, with actinic radiation, and

25 (3) applying a further clearcoat film II of a coating material II curable thermally and, if desired, with actinic radiation to the surface of the clearcoat film(s) I,

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(4) and then curing

(4.1) the clearcoat films I and II and the
basecoat film III together or

(4.2) the clearcoat film II alone,

thermally and, if desired, with actinic
radiation,

characterized in that the coating material II
and/or the coating material I, especially the
coating material II, is a coating material as
claimed in any of claims 1 to 11.

17. The use of the coating material as claimed in any
of claims 1 to 11, of the clearcoat system KL as
claimed in claim 12, of the clearcoat system KL
produced as claimed in claim 13, of the multicoat
paint system ML as claimed in claim 14, and of the
multicoat paint system produced as claimed in
claim 15 in automotive OEM finishing and
automotive refinish, industrial coating, including
coil coating and container coating, the coating of
plastics, and furniture coating.

18. Primed or unprimed substrates comprising at least
one clearcoat system KL as claimed in claim 12,
one clearcoat system KL produced as claimed in

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claim 13, one multicoat paint system ML as claimed
in claim 14 and/or one multicoat paint system ML
produced as claimed in claim 15.

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